National Aeronautics and Space Administration

GES DISC

Goddard Earth Sciences Data and Information Services Center

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README Document for

AIRS Level-2 Version 5 Cloud-Cleared IR Radiance:

AIRH2CCF	(AIRS, AMSU & HSB)
AIRI2CCF, AIRI2CCF_NRT	(AIRS & AMSU)
AIRS2CCF	(AIRS only)

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Revision History

Revision Date	***Changes***	***Author***
9/6/2007	Initial version	Young-In Won
2/15/2008	Revised to include AIRH2CCF and AIRS2CCF	Young-In Won
3/7/2008	Revised to include NRT Revised to add info on changes from version 4 to version 5	Young-In Won
7/22/2009	Revised to removed WHOM	Young-In Won

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1. Introduction

1.1 Brief background

This document applies to the Atmospheric Infrared Sounder (AIRS) **Version 5 Level-2 Cloud-Cleared IR Radiance products** which contain calibrated, geolocated channel-by-channel AIRS infrared radiances (milliWatts/m^2/cm^{-1}/steradian) that would have been observed within each Advanced Microwave Sounding Unit (AMSU) footprint if there were no clouds in the FOV and produced along with the AIRS Standard Product, as they are the radiances used to retrieve the Standard Product. Nevertheless, they are an order of magnitude larger in data volume than the remainder of the Standard Products and, many Standard Product users are expected to have little interest in the Cloud Cleared Radiance. For these reasons they are a separate output file, but like the Standard Product, are generated at all locations. A brief description on changes from Version 4 to version 5 products is given in the following section.

There are three products of **Cloud-Cleared IR Radiance** (see section 2.1 for further details): retrieval products using AIRS IR, AMSU, and HSB (**AIRH2CCF),** using AIRS IR and AMSU **(AIRI2CCF)** and AIRS IR only **(AIRS2CCF). AIRI2CCF Near Real Time** products are also available within ~3 hours of observations globally and stay for about 5 days from the time they are generated.

From 705.3 km altitude, an AMSU-A footprint at nadir is about 45 km in diameter. It contains 3×3 AIRS IR observations (each is about 13.5 km). Retrievals are performed inside AMSU-A footprints. Therefore, the final retrieval results have a horizontal resolution of 45 km. The data covers period from August 30, 2002 to current.

Table 1. Basic characteristics of the AIR Cloud-Cleared Radiance product.

Latitude Range	-90° to 90°N
Longitude extent	-180° to 180°E
horizontal resolution	45 km (~0.5 degree)
Temporal resolution	6 minutes

1.2 Significant changes from V4 to V5

We strongly encourage users to use V5 products rather than V4 (GES DISC Collection 3 data products). A short description on changes from V4 to V5 that are most visible to the user is given below.

Improved Quality Indicators and Error Estimates

In the V5 release, an improved set of quality indicators has been provided to inform the user separately about the quality of the retrieval of various products. Please read the Level 2 Quality Control and Error Estimation documentation for a description of these indicators and how they are set.

V5_L2_Quality_Control_and_Error_Estimation.pdf

The V5 temperature profile yield is increased and the error estimate improved. The greatest yield increase is in the polar regions, and the greatest improvement in quality is over land. The yield in moisture retrievals has decreased slightly, but the quality of the accepted retrieval has increased, their error estimates improved and there are fewer outliers. In particular, there are no longer anomalously high moisture retrievals over warm scenes and the upper tropospheric dry bias and total water vapor wet bias have both improved over V4.

Correction to Saturation and Relative Humidity

The layer-average vapor pressure saturation relation for water vapor is provided over liquid and over liquid/ice dependent upon air temperature. The relative humidity calculation error present in V4 has been corrected.

Correction to Outgoing Longwave Radiation

The OLR calculation error present in V4 has been corrected. There was no error in the calculation for clear-sky OLR (clrolr) in V4.

Improved O3 Product

The V5 ozone retrieval channel set has been refined and an observationally based climatology is used for a first guess rather than a regression. The result is that the V5 ozone retrievals are less biased in the mid to low troposphere.

Addition of CO and CH4 Products

V5 L2 products now include total burden and profiles for carbon monoxide and methane. V5 L3 products contain profiles for both carbon monoxide and methane along with total column carbon monoxide. The methane product is an unvalidated research product that is still being refined.

Averaging Kernel, Verticality and Degrees of Freedom

V5 L2 products now provide averaging kernel (in support product), verticality and degrees of freedom for moisture, ozone, carbon monoxide and methane profiles.

AMSU-A Level 1B Sidelobe Correction Implemented

V5 AMSU-A L1B products now provide a sidelobe-correct brightness temperature in addition to the antenna temperature. The temperature error calculation is now fully implemented.

no HSB and including HSB

The HSB instrument ceased operation on February 5, 2003 due to a mirror motor failure. Released V5 of AIRS Data Products provide two versions of the L2 and L3 data products up to the date of HSB failure, and a single version thereafter.

See **V5_Released_Proc_FileDesc.pdf**

for a complete description of the AIRS Data Product file name and local granule ID (LGID) convention.

Removal of VIS/NIR Derived Cloud Fields
The Visible/Near Infrared derived cloud fields have been removed in V5.

Preparation of AIRS-Only Processing Option
We have prepared an AIRS-Only processing option whose products become visible to users due to a degrade of AMSU channel.

A complete listing of the noteworthy changes from V4 to V5 is provided in the document:
V5_Changes_from_V4.pdf

1.3 AIRS Instrument Description

The Atmospheric Infrared Sounder (AIRS) instrument suite is designed to measure the Earth's atmospheric water vapor and temperature profiles on a global scale. It is comprised of a space-based hyperspectral infrared instrument (AIRS) and two multichannel microwave instruments, the Advanced Microwave Sounding Unit (AMSU-A) and the Humidity Sounder for Brazil (HSB). The AIRS instrument suite is one of several instruments onboard the Earth Observing System (EOS) Aqua spacecraft launched May 4, 2002. The HSB instrument ceased operation on February 5, 2003.

1.3.1 AIRS

AIRS is a high spectral resolution spectrometer on board Aqua satellite with 2378 bands in the thermal infrared (3.7 - 15.4 μm) and 4 bands in the visible (0.4 - 1.0 μm). These ranges have been specifically selected to allow determination of atmospheric temperature with an accuracy of 1°C in layers 1 km thick, and humidity with an accuracy of 20% in layers 2 km thick in the troposphere. In the cross-track direction, a ±49.5 degree swath centered on the nadir is scanned in 2 seconds, followed by a rapid scan in 2/3 second taking routine calibration related data that consist of four independent Cold Space Views, one view of the Onboard Blackbody Calibrator, one view of the Onboard Spectral Reference Source, and one view of a photometric calibrator for the VIS/NIR photometer. Each scan line contains 90 IR footprints, with a resolution of 13.5 km at nadir and 41km x 21.4 km at the scan extremes from nominal 705.3 km orbit. The Vis/NIR spatial resolution is approximately 2.3 km at nadir.

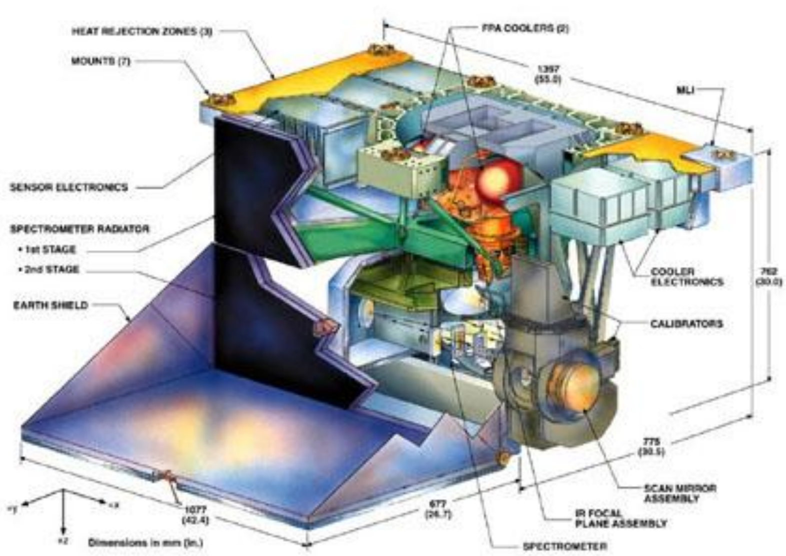


Figure 1. AIRS instrument cutaway drawing.

The primary spectral calibration of the AIRS spectrometer is based on the cross-correlation between spectral features observed in the upwelling radiance spectrum with precalculated spectra. And additional spectral reference source is provided to aid pre-launch testing in the thermal vacuum chamber during spacecraft integration and for quality monitoring in orbit.

Table 1. Technology - Specifications

Instrument Type	Multi-aperture, non-Littrow echelle array grating spectrometer.
Infrared Spectral Coverage	3.74 - 4.61 μm 6.20 - 8.22 μm 8.80 - 15.4 μm
Spectral Response	$\lambda/\Delta\lambda$ > 1200 nominal
Spectral Resolution	$\Delta\lambda/2$
Spectral Sampling	±1 $\Delta\lambda$
Integrated Response (95%)	0.05 $\Delta\lambda$ 24 hours
Wavelength Stability	0.01 $\Delta\lambda$
Scan Angle	±49.5° around nadir
Swath Width	1650 km nominal
Instantaneous Field of View (IFOV)	1.1°
Measurement Simultaneity	>99%
Sensitivity (NEDT)	0.14 K at 4.2 μm 0.20 K from 3.7 - 13.6 μm 0.35 K from 13.6 - 15.4 μm

Radiometric Calibration	±3% absolute error

1.3.2 AMSU-A

AMSU-A primarily provides temperature soundings. It is a 15-channel microwave temperature sounder implemented as two independently operated modules. Module 1 (AMSU-A1) has 12 channels in the 50-58 GHz oxygen absorption band which provide the primary temperature sounding capabilities and 1 channel at 89 GHz which provides surface and moisture information. Module 2 (AMSU-A2) has 2 channels: one at 23.8 GHz and one at 31.4 GHz which provide surface and moisture information (total precipitable water and cloud liquid water). Like AIRS, AMSU-A is a cross-track scanner. The three receiving antennas, two for AMSU-A1 and one for AMSU-A2, are parabolic focusing reflectors that are mounted on a scan axis at a 45° Tilt angle, so that radiation is reflected from a direction along the scan axis (a 90° reflection). AMSU-A scans three times as slowly as AIRS (once per 8 seconds) and its footprints are approximately three times as large as those of AIRS (45 km at nadir). This result in three AIRS scans per AMSU-A scans and nine AIRS footprints per AMSU-A footprint.

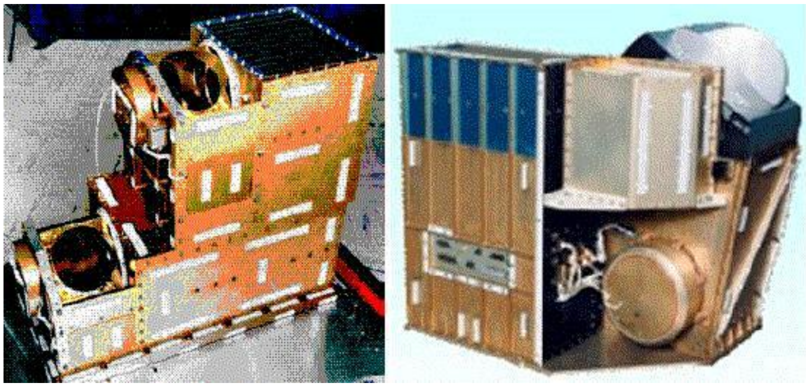


Figure 2. View of AMSU-A1 (left) and AMSU-A2 right.

Table 2. AMSU instrument characteristics

	AMSU-A1	AMSU-A2
Data Rate	1.3 kbits/s	0.5 kbits/s
Antenna Size	15 cm (2 units)	31 cm (1unit)
Instantaneous Field of View (IFOV)	3.3°	3.3°
Swath Width	100; 1650 km	100; 1650 km
Pointing Accuracy	± 0.2°	± 0.2°
Number of Channels	13	2

Sensor	Channel	Central Frequency	Bandwidth	Sensitivity NEDT

		(GHz)	(MHz)	(K)
AMSU-A2	1	23.8	270	0.3
	2	31.4	180	0.3
AMSU-A1	1	50.300	180	0.4
	2	52.800	400	0.25
	3	53.596±0.115	170	0.25
	4	54.400	400	0.25
	5	54.940	400	0.25
	6	55.500	330	0.25
	7	57.290344 = Flo	330	0.25
	8	Flo±0.217	78	0.4
	9	Flo±0.3222 (±0.048)	36	0.4
	10	Flo±0.3222 (±0.022)	16	0.6
	11	Flo±0.3222 (±0.010)	8	0.8
	12	Flo±0.3222 (±0.0045)	3	1.2
	13	89.000	6000	0.5

1.3.3 HSB

The Humidity Sounder for Brazil (HSB) is primarily a humidity sounder providing supplementary water vapor and liquid data to be used in the cloud clearing process. The HSB is a 4-channel microwave moisture sounder implemented as a single module. Three channels are located near 183 GHz, while the fourth is a window channel at 150 GHz. Physically HSB is identical to AMSU-B, which is operated by NOAA on its most recent POES satellites, but HSB lacks the fifth channel (89 GHz) of AMSU-B. Like AMSU-B, it samples ninety 1.1 ° scenes per 2.67-second crosstrack scan. Due to the higher spatial resolution (which equals that of AIRS) and a higher scan rate, the measurement density is 2.4 times that of AMSU-A (20 % less than for AMSU-B). HSB is very similar to AMSU-A, except that is contains only one antenna/receiver system. Its scan speed as well as its footprints is similar to AIRS (three scans per 8 seconds and about 15 km at nadir, respectively). There is therefore one HSB footprint per AIRS footprint.

The HSB is the object of a scientific and technical cooperation agreement between NASA and AEB (Agencia Espacial Brasileira), Brazilian Space Agency. The HSB instrument ceased operation on February 5, 2003 due to a mirror scan motor failure.

Table 3. HSB instrument characteristics

	HSB
Data Rate	4.2 kbps
Antenna Size	21.9 cm diameter
Instantaneous Field of View (IFOV)	1.1° degree circular

Swath Width		1650 km
Number of Channels		4
Channel Number	Central Frequency (GHz)	Bandwidth (MHz)
1*	Deleted (89GHz)	
2	150.0	4000
3	183.31 ± 1.0	2x500
4	183.31 ± 3.0	2x1000
5	183.31 ± 7.0	2x2000

1.4 Brief background on algorithm

Level 2 produces 240 granules (see section 2.1) of each of the following AIRS products:

Data Set	Short Name	Granule Size
L2 Cloud-cleared radiances	**AIRH2CCF** **AIRI2CCF** **AIRS2CCF**	**10 MB**
L2 Standard Product	AIRX2RET	5.4 MB
L2 Support Product	AIRX2SUP	20 MB

Each granule contains the data fields from 1350 retrievals laid out in an array of dimension 30x45, corresponding to the 30 AMSU footprints (cross-track) in each of 45 scansets (along-track).

Level 2 AIRI2CCF_NRT products are produced by the same core science algorithms as in the regular science data production, but using predicted ephemeris in place of definitive ephemeris data. The advantage of NRT data is its fast turnaround time, generally available within 3 hours of observations globally. They can be utilized in regional weather forecast models as well as in support of field campaigns.

Please refer to the Advanced Theoretical Basis Document (ATBD) for AIRS Level-2 products, AIRS-TEAM RETRIEVAL FOR CORE PRODUCTS AND GEOPHYSICAL PARAMETERS. Here is the table of contents:

The retrieval flow is also summarized in the AIRS/AMSU/HSB Version 5 Retrieval Flow document. Here is the table of contents of that document:

1.5 Data Disclaimer

AIRS science team provides AIRS/AMSU/HSB Version 5 Data Disclaimer document as a part of Version 005 data release, here is the table of contents:

2. Data Organization

2.1 Granularity

The continuous AIRS data is broken into a series of 6-minute segments. Each segment (granule) is a file. Over the course of 6 minutes the EOS Aqua platform travels approximately 1500 km, and the AIRS-suite instruments scan (whisk broom) a swath approximately 1500 km wide.

Start times of granules are keyed to the start of 1958. Because of leap seconds, they do not start at the same time as days do. For data from launch through 12-31-2005, granule 1 spans 00:05:26Z - 00:11:26Z and granule 240 starts at 23:59:26Z and ends at 00:05:26Z the next day. For data 12-31-2005 through the next leap second, granule 1 spans 00:05:25Z - 00:11:25Z and granule 240 starts at 23:59:25Z and ends at 00:05:25Z the next day.

2.2 File naming convention

There exist two versions of the Level 2 Standard Product files before February 5, 2003. On that date, the Humidity Sounder for Brazil (HSB) failed. The retrieval algorithm was adjusted to allow operation with and without ingesting HSB radiances. Retrievals for the period before February 5, 2003 are carried out with and without HSB. The AIRS Level 2 Cloud Cleared Product granules resulting from including HSB radiances have shortname "**AIRH2CCF**" and their file names incorporate this character string. Granules resulting from not ingesting HSB radiances have shortname "**AIRI2CCF**" and their file names incorporate this character string. This latter set carries through after February 5, 2003 to the current date and is the bulk of the AIRS Level 2 product. It is produced for the period before HSB failed so that a consistent product exists for the entire period of the operation of AIRS. More recently, new products resulting from AIRS IR only are added with shortname "**AIRS2CCF**". The new products are produced since the radiometric noise in AMSU channel 4 started to increase significantly (since May 2007).

The AIRS Level-2 Could-Cleared Radiance files are named in accordance to the following convention:

AIRS.*yyyy***.***mm***.***dd***.***ggg***.L2.CC_H.v***m.m.r.b***.***productionTimeStamp***.hdf (AIRH2CCF)**
AIRS.*yyyy***.***mm***.***dd***.***ggg***.L2.CC.v***m.m.r.b***.***productionTimeStamp***.hdf (AIRI2CCF, AIRI2CCF_NRT)**
AIRS.*yyyy***.***mm***.***dd***.***ggg***.L2.CC_IR.v***m.m.r.b***.***productionTimeStamp***.hdf (AIRS2CCF)**

For example: AIRS.2004.01.01.240.L2.CC.v5.0.14.0.G07193010935.hdf

Where:

- **yyyy** = 4 digit year number [2002 -].
- **mm** = 2 digit month number [01-12]
- **dd** = day of month [01-31]
- **ggg** = granule number [1-240]
- **L2** = Level 2
- **CC =** string defining the product file type (cloud cleared radiance)

- **vm.m.r.b** = algorithm version identifier is made up of major version, minor version, release version and build number respectively.
- **productionTimeStamp** = file creation time stamp. Starts off with a letter **G** for GES DISC processing facility (**R** for AIRI2CCF NRT product), followed by yydddhhmmss.
  - yy: year number without century;
  - ddd: day of a year [1-366];
  - hhmmss: hours, minutes and seconds UTC time.
- **hdf** = format of the file.

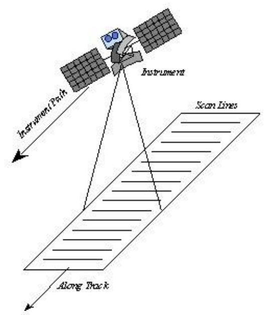
2.3 File Format

AIRS Level-2 files (including **AIRH2CCF, AIRI2CCF, AIRS2CCF**) are stored in the Hierarchical Data Format-Earth Observing System (HDF-EOS4) Swath format. HDF-EOS4 format is an extension of the HDF4 format (developed by NCSA) to meet the needs of EOS data products

HDF: The following website contains detailed information on HDF file format, http://hdf.ncsa.uiuc.edu/. HDFView, one of visual tool for browsing and editing NCSA HDF4 and HDF5 files would be of great help in viewing, creating, or modifying the contents of a dataset.

HDF-EOS: In 1993 NASA chose NCSA's HDF format to be the standard file format for storing data from the Earth Observing System (EOS), which is the data gathering system of sensors (mainly satellites) supporting the Global Climate Change Research Program. Since NASA's selection of HDF, NCSA (and now THG) has been working with NASA to prepare for the enormous data management challenges that will come when the system is fully functional. This has included the development of a specialized form of HDF called HDF-EOS, which deals specifically with the kinds of data that EOS produces.

Swath: The swath concept for HDF-EOS is based on a typical satellite swath, where an instrument takes a series of scans perpendicular to the ground track of the satellite as it moves along that ground track (see Diagram on the right). As the AIRS is profiling instrument that scans across the ground track, the data would be a three dimensional array of measurements where two of the dimensions correspond to the standard scanning dimensions (along the ground track and across the ground track), and the third dimension represents a range from the sensor. The "horizontal" dimensions can be handled as normal geographic dimensions, while the third dimensions can be handled as a special "vertical" dimension.



2.4 Data Structure inside File

An AIRS Level-2 cloud-cleared radiance file is made of four major groups; “Dimensions”, “geolocation fields”, “Attributes”, and “Data fields” with data fields sub-divided into “Per-Granule Data Fields”, "Along-Track Data Fields, and “Full Swath Data Fields”.

Dimensions: These are HDF-EOS swath dimensions. The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "GeoTrack" is understood to be the dimension along the path of the spacecraft, and "GeoXTrack" is the dimension across the spacecraft track, starting on the left looking forward along the spacecraft track. There may also be a second across-track dimension "CalXTrack," equivalent to "GeoXTrack," except that "CalXTrack" refers to the number of calibration footprints per scanline. "GeoTrack" is 45 for large-spot products (AMSU-A, Level-2, cloud-cleared AIRS) and 135 for small-spot products (AIRS, Vis/NIR, HSB).

geolocation fields: These are all 64-bit floating-point fields that give the location of the data in space and time. If the note before the table specifies that these fields appear once per scanline then they have the single dimension "GeoTrack." Otherwise, they appear once per footprint per scanline and have dimensions "GeoTrack,GeoXTrack."

Attributes: These are scalar or string fields that appear only once per granule. They are attributes in the HDF-EOS Swath sense.

Per-Granule Data Fields: These are fields that are valid for the entire granule but that are not scalars because they have some additional dimension.

Along-Track Data Fields: These are fields that occur once for every scanline. These fields have dimension "GeoTrack" before any "Extra Dimensions." So an "Along-Track Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack"; whereas, if the "Extra Dimensions" is "SpaceXTrack (= 4)," then it has dimensions "GeoTrack,SpaceXTrack."

2.5 Key data fields (see the following section for a complete list)

The data fields most likely to be used by users are as follows.

geolocation Fields:

- Latitude
  FOV boresight geodetic latitude (degrees North, -90->+90), dimension (30,45)
- Longitude
  FOV boresight geodetic longitude (degrees East, -180->+180), dimension (30,45)

Attributes:

- CalGranSummary
  Bit field that is a bitwise OR of CalScanSummary. Zero means that all “good” channels were well calibrated in the entire granule, dimension (1)

Per-Granule Data Fields:

- CalChanSummary
  Bit field that is a bitwise OR of CalFlag by channel over all scanlines. Zero means that channel was well calibrated in the entire granule, dimension (2378)

- ExcludedChans
  Bit field that indicates A/B detector weights, dimension (2378)
- NeN
  Noise equivalent radiance for each channel for an assumed 250 K scene (milliWatts/m2/cm-1/steradian), dimension (2378)
- nominal_freq
  nominal frequencies of each channel (cm-1), dimension (2378)
- NeN_L1B
  Level 1B noise equivalent radiances for an assumed 250 K scene. Note that effective noise on cloud-cleared radiances will be modified (milliWatts/m2/cm-1/steradian), dimension (2378)

Along-Track Data Fields:

- CalFlag
  Bit field by channel for each scanline. Zero means the channel was well calibrated, dimension (2378,45)
- CalScanSummary
  Bit field that is a bitwise OR over the good channel list (i.e., channels not in ExcludedChans). Zero means that all "good" channels were well calibrated for a scanline, dimension (45)

Swath Data Fields:

- Qual_CC_Rad
  overall quality flag for cloud-cleared radiances. 0 indicates highest quality; 1 indicates good quality; 2 means do not use, dimension (30,45)
- radiances
  cloud-cleared channel-by-channel observed infrared spectra that would have been observed over FOV in absence of clouds (milliWatts/m2/cm-1/steradian), dimension (2378,30,45)
- radiance_err
  error estimate for radiances (milliWatts/m2/cm-1/steradian), dimension (2378,30,45)
- CldClearParam
  cloud-clearing parameter eta, dimension (3,3,30,45)
- landFrac
  fraction of FOV that is land (0.0 -> 1.0), dimension (30,45)
- landFrac_err
  error estimate for landFrac, dimension (30,45)
- sun_glint_distance
  distance from FOV center to location of sun glint; -9999 if unknown and
  30000 for no glint visible because platform is in the Earth's shadow (km), dimension (30,45)
- solzen
  solar zenith angle (degrees, 0->180; daytime if < 85), dimension (30,45)
- scanang
  scanning angle of AIRS instrument with respect to the spacecraft for this
  FOV, negative at start of scan and zero at nadir (degrees, -180->180), dimension (30,45)

3. Data Contents

These products have exactly one swath per file. The swath name is given in the interface specification.

The names of all dimensions, geolocation fields, fields and attributes are exactly as given in the "Name" column of the appropriate table, including underscores and capitalization. The "Explanation" information, as provided in the product interface specifications, is a guide for users of the data and is not included the product files.

The contents of the "Type" column of the attribute and field tables can either specify a standard HDF type or a special AIRS type. The standard HDF types used by AIRS are:

String of 8-bit characters (Attributes only)
8-bit integer
8-bit unsigned integer
16-bit integer
16-bit unsigned integer
32-bit integer
32-bit unsigned integer
32-bit floating-point
64-bit floating-point

For all 16-bit or longer fields the value -9999 is used to flag bad or missing data. Special AIRS types are like structures, with the fields specified in tables as discussed below.

The first table of the interface specification lists "Dimensions" which are the HDF-EOS swath dimensions. The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "GeoTrack" is understood to be the dimension along the path of the spacecraft, and "GeoXTrack" is the dimension across the spacecraft track, starting on the left looking forward along the spacecraft track. There may also be a second across-track dimension "CalXTrack," equivalent to "GeoXTrack," except that "CalXTrack" refers to the number of calibration footprints per scanline. "GeoTrack" is 45 for large-spot products (AMSU-A, Level-2, cloud-cleared AIRS) and 135 for small-spot products (AIRS, Vis/NIR, HSB). These files contain no geolocation mappings or indexed mappings.

The second table specifies "geolocation fields." These are all 64-bit floating-point fields that give the location of the data in space and time. If the note before the table specifies that these fields appear once per scanline then they have the single dimension "GeoTrack." Otherwise, they appear once per footprint per scanline and have dimensions "GeoTrack,GeoXTrack."

The third table specifies "Attributes." These are scalar or string fields that appear only once per granule. They are attributes in the HDF-EOS Swath sense.

The fourth table specifies “Per-Granule Data Fields.” These are fields that are valid for the entire granule but that are not scalars because they have some additional dimension.

The fifth table specifies "Along-Track Data Fields." These are fields that occur once for every scanline. These fields have dimension "GeoTrack" before any "Extra Dimensions." So an "Along-Track Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack"; whereas, if the "Extra Dimensions" is "SpaceXTrack (= 4)," then it has dimensions "GeoTrack,SpaceXTrack."

The sixth table specifies "Full Swath Data Fields." These are fields that occur once for every footprint of every scanline. These have dimensions "GeoTrack,GeoXTrack" before any "Extra Dimensions." So a "Full Swath Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack,GeoXTrack"; whereas, if the "Extra Dimensions" is "Channel (= 2378)," then it has dimensions "GeoTrack,GeoXTrack,Channel."

3.1 Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath" data fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

Name	Value	Explanation
GeoXTrack	30	Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path
GeoTrack	# of scan lines in swath	Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities)
Channel	2378	Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.)
AIRSXTrack	3	The number of AIRS cross-track spots per AMSU-A spot. Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path
AIRSTrack	3	The number of AIRS along-track spots per AMSU-A spot. Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time

3.2 Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

Name	Explanation
Latitude	Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0)
Longitude	Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0)
Time	Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993

3.3 Attributes

These fields appear only once per granule and use the HDF-EOS "Attribute" interface.

Name	Type	Explanation
processing_level	string of 8-bit characters	Zero-terminated character string denoting processing level ("Level2")
instrument	string of 8-bit characters	Zero-terminated character string denoting instrument ("AIRS")
DayNightFlag	string of 8-bit characters	Zero-terminated character string set to "Night" when the subsatellite points at the beginning and end of a granule are both experiencing night according to the "civil twilight" standard (center of refracted sun is below the horizon). It is set to "Day" when both are experiencing day, and "Both" when one is experiencing day and the other night. "NA" is used when a determination cannot be made.
AutomaticQAFlag	string of 8-bit characters	Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect")
NumTotalData	32-bit integer	Total number of expected scene footprints
NumProcessData	32-bit integer	Number of scene footprints which are present and can be processed routinely (state = 0)
NumSpecialData	32-bit integer	Number of scene footprints which are present and can be processed only as a special test (state = 1)
NumBadData	32-bit integer	Number of scene footprints which are present but cannot be processed (state = 2)
NumMissingData	32-bit integer	Number of expected scene footprints which are not present (state = 3)
NumLandSurface	32-bit integer	Number of scene footprints for which the surface is more than 90% land
NumOceanSurface	32-bit integer	Number of scene footprints for which the surface is less than 10% land
node_type	string of 8-bit characters	Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules. "NA" when determination cannot be made.)
start_year	32-bit integer	Year in which granule started, UTC (e.g. 1999)
start_month	32-bit integer	Month in which granule started, UTC (1 ... 12)
start_day	32-bit integer	Day of month in which granule started, UTC (1 ... 31)
start_hour	32-bit integer	Hour of day in which granule started, UTC (0 ... 23)
start_minute	32-bit integer	Minute of hour in which granule started, UTC (0 ... 59)
start_sec	32-bit floating-point	Second of minute in which granule started, UTC (0.0 ... 59.0)
start_orbit	32-bit integer	Orbit number of mission in which granule started
end_orbit	32-bit integer	Orbit number of mission in which granule ended
orbit_path	32-bit integer	Orbit path of start orbit (1 ... 233 as defined by EOS project)
start_orbit_row	32-bit integer	Orbit row at start of granule (1 ... 248 as defined by EOS project)
end_orbit_row	32-bit integer	Orbit row at end of granule (1 ... 248 as defined by EOS project)
granule_number	32-bit	Number of granule within day (1 ... 240)

	integer	
num_scansets	32-bit integer	Number of scansets in granule (1 ... 45)
num_scanlines	32-bit integer	Number of scanlines in granule (3 * num_scansets)
start_Latitude	64-bit floating-point	Geodetic Latitude of spacecraft at start of granule (subsatellite location at midpoint of first scan) in degrees North (-90.0 ... 90.0)
start_Longitude	64-bit floating-point	Geodetic Longitude of spacecraft at start of granule (subsatellite location at midpoint of first scan) in degrees East (-180.0 ... 180.0)
start_Time	64-bit floating-point	TAI Time at start of granule (floating-point elapsed seconds since start of 1993)
end_Latitude	64-bit floating-point	Geodetic Latitude of spacecraft at end of granule (subsatellite location at midpoint of last scan) in degrees North (-90.0 ... 90.0)
end_Longitude	64-bit floating-point	Geodetic Longitude of spacecraft at end of granule (subsatellite location at midpoint of last scan) in degrees East (-180.0 ... 180.0)
end_Time	64-bit floating-point	TAI Time at end of granule (floating-point elapsed seconds since start of 1993)
eq_x_longitude	32-bit floating-point	Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0)
eq_x_tai	64-bit floating-point	Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993)
orbitgeoqa	32-bit unsigned integer	Orbit Geolocation QA:; Bit 0: (LSB, value 1) bad input value (last scanline); Bit 1: (value 2) bad input value (first scanline); Bit 2: (value 4) PGS_EPH_GetEphMet() gave PGSEPH_E_NO_SC_EPHEM_FILE; Bit 3: (value 8) PGS_EPH_GetEphMet() gave PGSEPH_E_BAD_ARRAY_SIZE; Bit 4: (value 16) PGS_EPH_GetEphMet() gave PGSTD_E_TIME_FMT_ERROR; Bit 5: (value 32) PGS_EPH_GetEphMet() gave PGSTD_E_TIME_VALUE_ERROR; Bit 6: (value 64) PGS_EPH_GetEphMet() gave PGSTD_E_SC_TAG_UNKNOWN; Bit 7: (value 128) PGS_EPH_GetEphMet() gave PGS_E_TOOLKIT; Bit 8: (value 256) PGS_TD_UTCtoTAI() gave PGSTD_E_NO_LEAP_SECS; Bit 9: (value 512) PGS_TD_UTCtoTAI() gave PGSTD_E_TIME_FMT_ERROR; Bit 10: (value 1024) PGS_TD_UTCtoTAI() gave PGSTD_E_TIME_VALUE_ERROR; Bit 11: (value 2048) PGS_TD_UTCtoTAI() gave PGS_E_TOOLKIT; Bit 12: (value 4096) PGS_CSC_DayNight() gave PGSTD_E_NO_LEAP_SECS; Bit 13: (value 8192) PGS_CSC_DayNight() gave PGSCSC_E_INVALID_LIMITTAG; Bit 14: (value 16384) PGS_CSC_DayNight() gave PGSCSC_E_BAD_ARRAY_SIZE; Bit 15: (value 32768) PGS_CSC_DayNight() gave PGSCSC_W_ERROR_IN_DAYNIGHT; Bit 16: (value 65536) PGS_CSC_DayNight() gave PGSCSC_W_BAD_TRANSFORM_VALUE; Bit 17: (value 131072) PGS_CSC_DayNight() gave PGSCSC_W_BELOW_HORIZON; Bit 18: (value 262144) PGS_CSC_DayNight() gave PGSCSC_W_PREDICTED_UT1 (This is expected except when reprocessing.); Bit 19: (value 524288) PGS_CSC_DayNight() gave PGSTD_E_NO_UT1_VALUE; Bit 20: (value 1048576) PGS_CSC_DayNight() gave PGSTD_E_BAD_INITIAL_TIME; Bit 21: (value 2097152) PGS_CSC_DayNight() gave PGSCBP_E_TIME_OUT_OF_RANGE; Bit 22: (value 4194304) PGS_CSC_DayNight() gave PGSCBP_E_UNABLE_TO_OPEN_FILE; Bit 23: (value 8388608) PGS_CSC_DayNight() gave PGSMEM_E_NO_MEMORY; Bit 24: (value 16777216) PGS_CSC_DayNight() gave PGS_E_TOOLKIT; Bit 25-31: not used
num_satgeoqa	16-bit integer	Number of scans with problems in satgeoqa
num_glintgeoqa	16-bit integer	Number of scans with problems in glintgeoqa

num_moongeoqa	16-bit integer	Number of scans with problems in moongeoqa
num_ftptgeoqa	16-bit integer	Number of footprints with problems in ftptgeoqa
num_zengeoqa	16-bit integer	Number of footprints with problems in zengeoqa
num_demgeoqa	16-bit integer	Number of footprints with problems in demgeoqa
num_fpe	16-bit integer	Number of floating point errors
LonGranuleCen	16-bit integer	Geodetic Longitude of the center of the granule in degrees East (-180 ... 180)
LatGranuleCen	16-bit integer	Geodetic Latitude of the center of the granule in degrees North (-90 ... 90)
LocTimeGranuleCen	16-bit integer	Local solar time at the center of the granule in minutes past midnight (0 ... 1439)
CalGranSummary	8-bit unsigned integer	Bit field. Bitwise OR of CalChanSummary, over all channels with ExcludedChans < 3. Zero means all these channels were well calibrated, for all scanlines. Bit 7: (MSB, value 128) scene over/underflow; Bit 6: (value 64) anomaly in offset calculation; Bit 5: (value 32) anomaly in gain calculation; Bit 4: (value 16) pop detected with no offset anomaly; Bit 3: (value 8) noise out of bounds; Bit 2: (value 4) anomaly in spectral calibration; Bit 1: (value 2) Telemetry; Bit 0: (LSB, value 1) unused (reserved);
DCR_scan	16-bit integer	Level-1B scanline number following (first) DC-Restore. 0 for no DC-Restore. DCR_scan refers to Level-1 8/3-second scans, not Level-2 8-second scansets. DCR_scan = 1 refers to an event before the first scan of the first scanset; DCR_scan = 2 or 3 refer to events within the first scanset, DCR_scan = 4 to events between the first and second scansets.
granules_present_L1B	string of 8-bit characters	Zero-terminated character string denoting which adjacent granules were available for smoothing during Level-1B calibration processing. ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next)

3.4 Per-Granule Data Fields

These fields appear only once per granule and use the HDF-EOS "Field" interface.

Name	Type	Extra Dimensions	Explanation
nominal_freq	32-bit floating-point	Channel (= 2378)	Nominal frequencies (in cm**-1) of each channel
CalChanSummary	8-bit unsigned integer	Channel (= 2378)	Bit field. Bitwise OR of CalFlag, by channel, over all scanlines. Noise threshold and spectral quality added. Zero means the channel was well calibrated for all scanlines Bit 7 (MSB): scene over/underflow; Bit 6: (value 64) anomaly in offset calculation; Bit 5: (value 32) anomaly in gain calculation; Bit 4: (value 16) pop detected with no offset anomaly; Bit 3: (value 8) noise out of bounds; Bit 2: (value 4) anomaly in spectral calibration; Bit 1: (value 2) Telemetry; Bit 0: (LSB, value 1) unused (reserved);
ExcludedChans	8-bit unsigned integer	Channel (= 2378)	An integer 0-6, indicating A/B detector weights. Used in L1B processing. 0 - A weight = B weight. Probably better that channels with state > 2; 1 - A-side only. Probably better that channels with state > 2; 2 - B-side only. Probably better that channels with state > 2; 3 - A weight = B weight. Probably better than channels with state = 6; 4 - A-side only. Probably better than channels with state = 6; 5 - B-side only. Probably better than channels with state = 6;

			6 - A weight = B weight.
NeN_L1B	32-bit floating-point	Channel (= 2378)	Level-1B Noise-equivalent Radiance (radiance units) for an assumed 250K scene. Note that effective noise on cloud-cleared radiances will be modified.

3.5 Along-Track Data Fields

These fields appear once per scanline (GeoTrack times).

Name	Type	Extra Dimensions	Explanation
satheight	32-bit floating-point	None	Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2)
satroll	32-bit floating-point	None	Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.)
satpitch	32-bit floating-point	None	Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.)
satyaw	32-bit floating-point	None	Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented Earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.)
satgeoqa	32-bit unsigned integer	None	Satellite Geolocation QA flags: Bit 0: (LSB, value 1) bad input value; Bit 1: (value 2) PGS_TD_TAItoUTC() gave PGSTD_E_NO_LEAP_SECS; Bit 2: (value 4) PGS_TD_TAItoUTC() gave PGS_E_TOOLKIT; Bit 3: (value 8) PGS_EPH_EphemAttit() gave PGSEPH_W_BAD_EPHEM_VALUE; Bit 4: (value 16) PGS_EPH_EphemAttit() gave PGSEPH_E_BAD_EPHEM_FILE_HDR; Bit 5: (value 32) PGS_EPH_EphemAttit() gave PGSEPH_E_NO_SC_EPHEM_FILE; Bit 6: (value 64) PGS_EPH_EphemAttit() gave PGSEPH_E_NO_DATA_REQUESTED; Bit 7: (value 128) PGS_EPH_EphemAttit() gave PGSTD_E_SC_TAG_UNKNOWN; Bit 8: (value 256) PGS_EPH_EphemAttit() gave PGSEPH_E_BAD_ARRAY_SIZE; Bit 9: (value 512) PGS_EPH_EphemAttit() gave PGSTD_E_TIME_FMT_ERROR; Bit 10: (value 1024) PGS_EPH_EphemAttit() gave PGSTD_E_TIME_VALUE_ERROR; Bit 11: (value 2048) PGS_EPH_EphemAttit() gave PGSTD_E_NO_LEAP_SECS; Bit 12: (value 4096) PGS_EPH_EphemAttit() gave PGS_E_TOOLKIT; Bit 13: (value 8192) PGS_CSC_ECItoECR() gave PGSCSC_W_BAD_TRANSFORM_VALUE; Bit 14: (value 16384) PGS_CSC_ECItoECR() gave PGSCSC_E_BAD_ARRAY_SIZE; Bit 15: (value 32768) PGS_CSC_ECItoECR() gave PGSTD_E_NO_LEAP_SECS; Bit 16: (value 65536) PGS_CSC_ECItoECR() gave PGSTD_E_TIME_FMT_ERROR; Bit 17: (value 131072) PGS_CSC_ECItoECR() gave PGSTD_E_TIME_VALUE_ERROR; Bit 18: unused (set to zero); Bit 19: (value 524288) PGS_CSC_ECItoECR() gave PGSTD_E_NO_UT1_VALUE; Bit 20: (value 1048576) PGS_CSC_ECItoECR() gave PGS_E_TOOLKIT; Bit 21: (value 2097152) PGS_CSC_ECRtoGEO() gave PGSCSC_W_TOO_MANY_ITERS; Bit 22: (value 4194304) PGS_CSC_ECRtoGEO() gave PGSCSC_W_INVALID_ALTITUDE; Bit 23: (value 8388608) PGS_CSC_ECRtoGEO() gave PGSCSC_W_SPHERE_BODY; Bit 24: (value 16777216) PGS_CSC_ECRtoGEO() gave PGSCSC_W_LARGE_FLATTENING; Bit 25: (value 33554432) PGS_CSC_ECRtoGEO() gave PGSCSC_W_DEFAULT_EARTH_MODEL; Bit 26: (value 67108864) PGS_CSC_ECRtoGEO() gave PGSCSC_E_BAD_EARTH_MODEL; Bit 27: (value 134217728) PGS_CSC_ECRtoGEO() gave PGS_E_TOOLKIT; Bit 28-31: not used

glintgeoqa	16-bit unsigned integer	None	Glint Geolocation QA flags: Bit 0: (LSB, value 1) bad input value; Bit 1: (value 2) glint location in Earth's shadow (Normal for night FOVs); Bit 2: (value 4) glint calculation not converging; Bit 3: (value 8) glint location sun vs. satellite zenith mismatch; Bit 4: (value 16) glint location sun vs. satellite azimuth mismatch; Bit 5: (value 32) bad glint location; Bit 6: (value 64) PGS_CSC_ZenithAzimuth() gave any 'W' class return code; Bit 7: (value 128) PGS_CSC_ZenithAzimuth() gave any 'E' class return code; Bit 8: (value 256) PGS_CBP_Earth_CB_Vector() gave any 'W' class return code; Bit 9: (value 512) PGS_CBP_Earth_CB_Vector() gave any 'E' class return code; Bit 10: (value 1024) PGS_CSC_ECItoECR() gave any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); Bit 11: (value 2048) PGS_CSC_ECItoECR() gave any 'E' class return code (for Glint); Bit 12: (value 4096) PGS_CSC_ECRtoGEO() gave any 'W' class return code (for Glint); Bit 13: (value 8192) PGS_CSC_ECRtoGEO() gave any 'E' class return code (for Glint); Bit 14: (value 16384) PGS_CSC_ECItoECR() gave any 'W' class return code except PGSCSC_W_PREDICTED_UT1 ; Bit 15: (value 32768) PGS_CSC_ECItoECR() gave any 'E' class return code
moongeoqa	16-bit unsigned integer	None	Moon Geolocation QA flags: Bit 0: (LSB, value 1) bad input value; Bit 1: (value 2) PGS_TD_TAItoUTC() gave PGSTD_E_NO_LEAP_SECS; Bit 2: (value 4) PGS_TD_TAItoUTC() gave PGS_E_TOOLKIT; Bit 3: (value 8) PGS_CBP_Sat_CB_Vector() gave PGSCSC_W_BELOW_SURFACE; Bit 4: (value 16) PGS_CBP_Sat_CB_Vector() gave PGSCBP_W_BAD_CB_VECTOR; Bit 5: (value 32) PGS_CBP_Sat_CB_Vector() gave PGSCBP_E_BAD_ARRAY_SIZE; Bit 6: (value 64) PGS_CBP_Sat_CB_Vector() gave PGSCBP_E_INVALID_CB_ID; Bit 7: (value 128) PGS_CBP_Sat_CB_Vector() gave PGSMEM_E_NO_MEMORY; Bit 8: (value 256) PGS_CBP_Sat_CB_Vector() gave PGSCBP_E_UNABLE_TO_OPEN_FILE; Bit 9: (value 512) PGS_CBP_Sat_CB_Vector() gave PGSTD_E_BAD_INITIAL_TIME; Bit 10: (value 1024) PGS_CBP_Sat_CB_Vector() gave PGSCBP_E_TIME_OUT_OF_RANGE; Bit 11: (value 2048) PGS_CBP_Sat_CB_Vector() gave PGSTD_E_SC_TAG_UNKNOWN; Bit 12: (value 4096) PGS_CBP_Sat_CB_Vector() gave PGSEPH_E_BAD_EPHEM_FILE_HDR; Bit 13: (value 8192) PGS_CBP_Sat_CB_Vector() gave PGSEPH_E_NO_SC_EPHEM_FILE; Bit 14: (value 16384) PGS_CBP_Sat_CB_Vector() gave PGS_E_TOOLKIT; Bit 15: not used
nadirTAI	64-bit floating-point	None	TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993)
sat_lat	64-bit floating-point	None	Satellite geodetic latitude in degrees North (-90.0 ... 90.0)
sat_lon	64-bit floating-point	None	Satellite geodetic longitude in degrees East (-180.0 ... 180.0)
scan_node_type	8-bit integer	None	'A' for ascending, 'D' for descending, 'E' when an error is encountered in trying to determine a value.
glintlat	32-bit floating-point	None	Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0)
glintlon	32-bit floating-point	None	Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0)
CalFlag	8-bit unsigned	Channel (= 2378)	Bit field, by channel, for calibration the current scanset. Zero means the channel was well calibrated, for this scanset. Bit 7: (MSB, value 128) scene over/underflow;

	integer		Bit 6: (value 64) anomaly in offset calculation; Bit 5: (value 32) anomaly in gain calculation; Bit 4: (value 16) pop detected; Bit 3: (value 8) DCR Occurred; Bit 2: (value 4) Moon in View; Bit 1: (value 2) telemetry out of limit condition; Bit 0: (LSB, value 1) cold scene noise
CalScanSummary	8-bit unsigned integer	None	Bit field. Bitwise OR of CalFlag over the good channel list (see ExcludedChans). Zero means all "good" channels were well calibrated for this scanset Bit 7: (MSB, value 128) scene over/underflow; Bit 6: (value 64) anomaly in offset calculation; Bit 5: (value 32) anomaly in gain calculation; Bit 4: (value 16) pop detected; Bit 3: (value 8) DCR Occurred; Bit 2: (value 4) Moon in View; Bit 1: (value 2) telemetry out of limit condition; Bit 0: (LSB, value 1) cold_scene noise

3.6 Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times).

Name	Type	Extra Dimensions	Explanation
Qual_CC_Rad	16-bit unsigned integer	None	Overall quality flag for cloud cleared radiances. 0: Highest Quality; 1: Good Quality; 2: Do Not Use
radiances	32-bit floating-point	Channel (= 2378)	Cloud-cleared radiances for each channel in milliWatts/m**2/cm**-1/steradian
radiance_err	32-bit floating-point	Channel (= 2378)	Error estimate for radiances (milliWatts/m**2/cm**-1/steradian)
CldClearParam	32-bit floating-point	AIRSTrack (= 3) * AIRSXTrack (= 3)	Cloud clearing parameter Eta
scanang	32-bit floating-point	None	Scanning angle of the central AIRS instrument field-of-view with respect to the spacecraft (-180.0 ... 180.0, negative at start of scan, 0 at nadir)
ftptgeoqa	32-bit unsigned integer	None	Footprint Geolocation QA flags: Bit 0: (LSB, value 1) bad input value; Bit 1: (value 2) PGS_TD_TAItoUTC() gave PGSTD_E_NO_LEAP_SECS; Bit 2: (value 4) PGS_TD_TAItoUTC() gave PGS_E_TOOLKIT; Bit 3: (value 8) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_MISS_EARTH; Bit 4: (value 16) PGS_CSC_GetFOV_Pixel() gave PGSTD_E_SC_TAG_UNKNOWN; Bit 5: (value 32) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_ZERO_PIXEL_VECTOR; Bit 6: (value 64) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_BAD_EPH_FOR_PIXEL; Bit 7: (value 128) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_INSTRUMENT_OFF_BOARD; Bit 8: (value 256) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_BAD_ACCURACY_FLAG; Bit 9: (value 512) PGS_CSC_GetFOV_Pixel() gave PGSCSC_E_BAD_ARRAY_SIZE; Bit 10: (value 1024) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_DEFAULT_EARTH_MODEL; Bit 11: (value 2048) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_DATA_FILE_MISSING; Bit 12: (value 4096) PGS_CSC_GetFOV_Pixel() gave PGSCSC_E_NEG_OR_ZERO_RAD; Bit 13: (value 8192) PGS_CSC_GetFOV_Pixel() gave PGSMEM_E_NO_MEMORY; Bit 14: (value 16384) PGS_CSC_GetFOV_Pixel() gave PGSTD_E_NO_LEAP_SECS;

			Bit 15: (value 32768) PGS_CSC_GetFOV_Pixel() gave PGSTD_E_TIME_FMT_ERROR; Bit 16: (value 65536) PGS_CSC_GetFOV_Pixel() gave PGSTD_E_TIME_VALUE_ERROR; Bit 17: (value 131072) PGS_CSC_GetFOV_Pixel() gave PGSCSC_W_PREDICTED_UT1; Bit 18: (value 262144) PGS_CSC_GetFOV_Pixel() gave PGSTD_E_NO_UT1_VALUE; Bit 19: (value 524288) PGS_CSC_GetFOV_Pixel() gave PGS_E_TOOLKIT; Bit 20: (value 1048576) PGS_CSC_GetFOV_Pixel() gave PGSEPH_E_BAD_EPHEM_FILE_HDR; Bit 21: (value 2097152) PGS_CSC_GetFOV_Pixel() gave PGSEPH_E_NO_SC_EPHEM_FILE; Bit 22-31: not used
zengeoqa	16-bit unsigned integer	None	Satellite zenith Geolocation QA flags: Bit 0: (LSB, value 1) (Spacecraft) bad input value; Bit 1: (value 2) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_W_BELOW_HORIZON; Bit 2: (value 4) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_W_UNDEFINED_AZIMUTH; Bit 3: (value 8) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_W_NO_REFRACTION; Bit 4: (value 16) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_E_INVALID_VECTAG; Bit 5: (value 32) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_E_LOOK_PT_ALTIT_RANGE; Bit 6: (value 64) PGS_CSC_ZenithAzimuth(S/C) gave PGSCSC_E_ZERO_INPUT_VECTOR; Bit 7: (value 128) PGS_CSC_ZenithAzimuth(S/C) gave PGS_E_TOOLKIT; Bit 8: (value 256) (Sun) bad input value; Bit 9: (value 512) (suppressed) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); Bit 10: (value 1024) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_W_UNDEFINED_AZIMUTH; Bit 11: (value 2048) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_W_NO_REFRACTION; Bit 12: (value 4096) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_E_INVALID_VECTAG; Bit 13: (value 8192) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_E_LOOK_PT_ALTIT_RANGE; Bit 14: (value 16384) PGS_CSC_ZenithAzimuth(Sun) gave PGSCSC_E_ZERO_INPUT_VECTOR; Bit 15: (value 32768) PGS_CSC_ZenithAzimuth(Sun) gave PGS_E_TOOLKIT
demgeoqa	16-bit unsigned integer	None	Digital Elevation Model (DEM) Geolocation QA flags: Bit 0: (LSB, value 1) bad input value; Bit 1: (value 2) Could not allocate memory; Bit 2: (value 4) Too close to North or South pole. Excluded. (This is not an error condition - a different model is used); Bit 3: (value 8) Layer resolution incompatibility. Excluded; Bit 4: (value 16) Any DEM Routine (elev) gave PGSDEM_E_IMPROPER_TAG; Bit 5: (value 32) Any DEM Routine (elev) gave PGSDEM_E_CANNOT_ACCESS_DATA; Bit 6: (value 64) Any DEM Routine (land/water) gave PGSDEM_E_IMPROPER_TAG; Bit 7: (value 128) Any DEM Routine (land/water) gave PGSDEM_E_CANNOT_ACCESS_DATA; Bit 8: (value 256) Reserved for future layers; Bit 9: (value 512) Reserved for future layers; Bit 10: (value 1024) PGS_DEM_GetRegion(elev) gave PGSDEM_M_FILLVALUE_INCLUDED; Bit 11: (value 2048) PGS_DEM_GetRegion(land/water) gave PGSDEM_M_FILLVALUE_INCLUDED; Bit 12: (value 4096) Reserved for future layers;

			Bit 13: (value 8192) PGS_DEM_GetRegion(all) gave PGSDEM_M_MULTIPLE_RESOLUTIONS; Bit 14: (value 16384) PGS_CSC_GetFOV_Pixel() gave any 'W' class return code except PGSCSC_W_PREDICTED_UT1; Bit 15: (value 32768) PGS_CSC_GetFOV_Pixel() gave any 'E' class return code
satzen	32-bit floating-point	None	Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.)
satazi	32-bit floating-point	None	Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO)
solzen	32-bit floating-point	None	Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.)
solazi	32-bit floating-point	None	Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO)
sun_glint_distance	16-bit integer	None	Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow)
topog	32-bit floating-point	None	Mean topography in meters above reference ellipsoid
topog_err	32-bit floating-point	None	Error estimate for topog
landFrac	32-bit floating-point	None	Fraction of spot that is land (0.0 ... 1.0)
landFrac_err	32-bit floating-point	None	Error estimate for landFrac
dust_flag	16-bit integer	None	Flag telling whether dust was detected in any of the 9 Level-1B IR fields of view that make up this scene; 1: Dust detected in at least one contributing FOV; 0: Dust test valid in at least one contributing IR FOV but dust not detected in any of the valid contributing IR FOVs; -1: Dust test not valid for any contributing IR FOV (land, poles, cloud, problem with inputs)
CC_noise_eff_amp_factor	32-bit floating-point	None	Effective amplification of noise in IR window channels due to extrapolation in cloud clearing and uncertainty of clear state. (< 1.0 for noise reduction, >1.0 for noise amplification, -9999.0 for unknown)
CCfinal_Resid	32-bit floating-point	None	Internal retrieval quality indicator -- residual between the final cloud cleared radiances for channels used in the determination and the radiances calculated from the best estimate of clear, in K
invalid	8-bit integer	None	Profile is not valid
all_spots_avg	8-bit integer	None	1: the cloud clearing step judged the scene to be clear enough that it averaged all spots' radiances; 0: cloud clearing was applied to the radiances; -1/255: cloud clearing not attempted
MW_ret_used	8-bit integer	None	MW-only final retrieval used
bad_clouds	8-bit integer	None	invalid cloud parameters
retrieval_type	8-bit integer	None	Deprecated -- use species-specific Qual_Xxx instead. Retrieval type: 0 for full retrieval; 10 for MW + final succeeded, initial retrieval failed; 20 for MW + initial succeeded, final failed; 30 for only MW stage succeeded, initial + final retrieval failed; 40 for MW + initial succeeded, final cloud-clearing failed; 50 for only MW stage succeeded, initial + final cloud-clearing failed; 100 for no retrieval;

Startup	8-bit integer	None	Source of startup input atmospheric state used in first cloud clearing step.; 0: MW-only retrieval; 1: IR-Only cloudy regression; 2: IR+MW cloudy regression, with some info from MW-only physical retrieval
RetQAFlag	16-bit unsigned integer	None	Obsolete. Use species-specific Qual_Xxx instead. Retrieval QA flags. Bit 15: spare, set to zero.; Bit 14 (value 16384): Ozone retrieval is suspect or rejected. (see Qual_O3 for details); Bit 13 (value 8192): Water vapor retrieval is suspect or rejected. (see Qual_H2O for details); Bit 12 (value 4096): Top part of temperature profile quality check failed or not attempted. (above Press_mid_top_bndry mbar, indices nStd_mid_top_bndry and nSup_mid_top_bndry; see Qual_Temp_Profile_Top for details); Bit 11 (value 2048): Middle part of temperature profile quality check failed or not attempted. (between Press_bot_mid_bndry and Press_top_mid_bndry mbar, indices nStd_bot_mid_bndry, nSup_bot_mid_bndry, nStd_bot_mid_bndry, and nSup_bot_mid_bndry; see Qual_Temp_Profile_Mid for details); Bit 10 (value 1024): Bottom part of temperature profile quality check failed or not attempted. (below Press_bot_mid_bndry mbar, indices nStd_bot_mid_bndry and nSup_bot_mid_bndry; see Qual_Temp_Profile_Bot for details); Bit 9 (value 512): Surface retrieval is suspect or rejected. (see Qual_Surf for details); Bit 8 (value 256): This record type not yet validated. For v4.0 all regions North of Latitude 50.0 degrees or South of Latitude -50.0 degrees will be flagged.; Bits 6-7: spare, set to zero; Bit 5 (value 32): Cloud retrieval rejected or not attempted; Bit 4 (value 16): Final retrieval rejected or not attempted; Bit 3 (value 8): Final Cloud Clearing rejected or not attempted; Bit 2 (value 4): Regression First Retrieval rejected or not attempted; Bit 1 (value 2): Initial Cloud Clearing rejected or not attempted; Bit 0 (LSB, value 1): Startup retrieval (MW-Only and/or cloudy regression depending on Startup) rejected or not attempted

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4. Options for Reading Data

The HDF Group provides various utilities for viewing the contents of HDF files and extracting the raster, binary, or ASCII objects (see http://hdf.ncsa.uiuc.edu/products/index.html)

4.1 Command-line utilities

4.1.1 read_hdf

The read_hdf tool is a command-line utility developed by GES DISC. It allows user to browse the file structure and display data values if desired. The source code is written in C language and can be obtained from: ftp://disc1.gsfc.nasa.gov/software/aura/read_hdf

Command line syntax:

```
read_hdf [-l] | [[-i | -d] [-a <output> | -b <base>.*.bin ]]  filename

Options/Arguments:

   [-i] -- run in interactive mode (default), or
   [-l] -- list a tree of file objects, or
   [-d] -- dump all HDF object types (no filtering)
   [-a <output>] -- ASCII output file name (default is <filename>.txt)
   [-b <base>] -- base binary output file name (default is <filename>)
                  creates two files per HDF object:
                  <base>.*.met for metadata, and <base>.*.bin for binary data
                  (default output to stdout)
   filename -- name of the input HDF file
```

4.1.2 ncdump

The **ncdump** dumps HDF to ASCII format

```
ncdump [-c|-h] [-v ...] [[-b|-f] [c|f]] [-l len] [-n name] [-d n[,n]]
filename

Options/Arguments:
  [-c]                 Coordinate variable data and header information
  [-h]                 Header information only, no data
  [-v var1[,...]]      Data for variable(s) <var1>,... only
  [-b [c|f]]           Brief annotations for C or Fortran indices in data
  [-f [c|f]]           Full annotations for C or Fortran indices in data
  [-l len]             Line length maximum in data section (default 80)
  [-n name]            Name for netCDF (default derived from file name)
  [-d n[,n]]           Approximate floating-point values with less precision
  filename             File name of input netCDF file

e.g.
     ncdump <inputfilename.hdf>
```

```
        dumps the entire contents of an HDF file to ASCII format
ncdump -v <variable name> <inputfilename.hdf>
        dump one data variable from the HDF file to ASCII format
ncdump -h <inputfilename.hdf> | more
        dump only the metadata information to the screen
ncdump -h <inputfilename.hdf> > ascii.out
        dump this metadata information to an output file named ascii.out
```

Note: the ncdump tool will only display variables whose ranks are great than 1. In other words, you will not see one dimensional vectors such as *satheight* using this tool.

The ncdump -H command provides instructions for using ncdump. Comprehensive yet simple instructions for extracting data and metadata from HDF files are given below. The following website (http://nsidc.org/data/hdfeos/hdf_to_ascii.html) provides step-by-step instructions on how to download, install and execute ncdump commands.

4.1.3 hdp

hdp is a command line utility designed for quick display of contents and data of HDF objects. It can list the contents of hdf files at various levels with different details. It can also dump the data of one or more specific objects in the file.

```
Usage: hdp [-H] command [command options] <filelist>
         -H  Display usage information about the specified command.
             If no command is specified, -H lists all commands.

         Commands:
             list       lists contents of files in <filelist>
             dumpsds    displays data of SDSs in <filelist>
             dumpvd     displays data of vdatas in <filelist>.
             dumpvg     displays data of vgroups in <filelist>.
             dumprig    displays data of RIs in <filelist>.
             dumpgr     displays data of RIs in <filelist>.
```

Detailed information on how to download, install and execute **hdp** command is found at http://nsidc.org/data/hdfeos/hdf_to_binary.html

4.2 GUI tools

The HDFView (http://hdf.ncsa.uiuc.edu/hdf-java-html/hdfview/) is a visual tool for browsing and editing NCSA HDF4 and HDF5 files and is available for various platforms (Windows 98/NT/2000/XP, Solaris, Linux, AIX, Irix 6.5, MacOSX). Using HDFView, you can:

(1) view a file hierarchy in a tree structure
(2) create new file, add or delete groups and datasets
(3) view and modify the content of a dataset
(4) add, delete and modify attributes
(5) replace I/O and GUI components such as table view, image view and metadata view

Users, especially **those who are not familiar with Unix/Linux environment** are strongly encouraged to use HDFView for a quick access to data contents.
There is also an add-on plug-in for handling HDFEOS data specifically, which you can download from: http://opensource.gsfc.nasa.gov/projects/hdf/hdf.php

4.3 Read software in IDL, MATLAB, C, and Fortran

AIRS science team provides reader software in IDL, MATLAB, C and FORTRAN programming language. You can download them from GES DISC web site:

(1) IDL / MATLAB suite along with sample HDFEOS data files (http://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/AIRS_V5_Release_User_Docs/IDL_MATLAB_READERS.tar.gz)
(2) FORTRAN / C suite along with sample HDFEOS data files (http://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/AIRS_V5_Release_User_Docs/FORTRAN_C_READERS.tar.gz)

If you want to program yourself, the programming model for accessing a swath data set through the swath (SW) interface is as follows:

(1) Open the file and obtain a file id from a file name.
(2) Open a swath data set by obtaining a swath id from a swath name.
(3) Perform desired operations on the data set.
(4) Close the swath data set by disposing of the swath id.
(5) Terminate swath access to the file by disposing of the file id.

A complete list of swath interface routines is summarized in the next two pages. To read an HDFEOS data file, access, basic I/O and inquiry routines are of particular interest.

Summary of HDF-EOS Swath Interface

Category	Routine Name		Description
	C	FORTRAN	
Access	SWopen	swopen	opens or creates HDF file in order to create, read, or write a swath
	SWcreate	swcreate	creates a swath within the file
	SWattach	swattach	attaches to an existing swath within the file
	SWdetach	swdetach	detaches from swath interface
	SWclose	swclose	closes file
Definition	SWdefdim	swdefdim	defines a new dimension within the swath
	SWdefdimmap	swdefmap	defines the mapping between the geolocation and data dimensions
	SWdefidxmap	swdefimap	defines a non-regular mapping between the geolocation and data dimension
	SWdefgeofield	swdefgfld	defines a new geolocation field within the swath
	SWdefdatafield	swdefdfld	defines a new data field within the swath
	SWdefprofile		defines the profile data structure within the swath
	SWdefcomp	swdefcomp	defines a field compression scheme
	SWwritegeometa	swwrgmeta	writes field metadata for an existing swath geolocation field
	SWwritedatameta	swwrdmeta	writes field metadata for an existing swath data field
Basic I/O	SWwritefield	swwrfld	writes data to a swath field
	SWreadfield	swrdfld	reads data from a swath field.
	SWwriteprofile		writes data to the profile
	SWreadprofile		reads data from the profile
	SWwriteattr	swwrattr	writes/updates attribute in a swath
	SWreadattr	swrdattr	reads attribute from a swath
	SWwritegrpattr	swwrgattr	writes/updates attribute as a swath
	SWreadgrpattr	swrdgattr	reads group attribute from a swath
	SWwritelocattr	swwrlattr	writes/updates local attribute in a swath
	SWreadlocattr	swrdlattr	reads local attribute from a swath
	SWsetfillvalue	swsetfill	sets fill value for the specified field
	SWgetfillvalue	swgetfill	retrieves fill value for the specified field
Inquiry	SWinqdims	swinqdims	retrieves information about dimensions defined in swath
	SWinqmaps	swinqmaps	retrieves information about the geolocation relations defined
	SWinqidxmaps	swinqimaps	retrieves information about the indexed geolocation/data mappings defined
	SWinqgeofields	swinqgflds	retrieves information about the geolocation fields defined
	SWinqdatafields	swinqdflds	retrieves information about the data fields defined
	SWinqattrs	swinqattrs	retrieves number and names of attributes defined
	SWinqgrpattrs	swinqgattrs	retrieves number and names of group attributes defined
	SWinqlocattrs	swinqlattrs	retrieves number and names of local attributes defined
	SWnentries	swnentries	returns number of entries and descriptive string buffer size for a specified entity
	SWdiminfo	swdiminfo	retrieve size of specified dimension
	SWgrpattrinfo	swgattrinfo	retrieves information about swath group attributes
	SWlocattrinfo	swlattrinfo	returns information about swath local attributes

Summary of HDF-EOS Swath Interface

Category	Routine Name		Description
	C	FORTRAN	
	SWmapinfo	swmapinfo	retrieve offset and increment of specified geolocation mapping
	SWidxmapinfo	swimapinfo	retrieve offset and increment of specified geolocation mapping
	SWattrinfo	swattrinfo	returns information about swath attributes
	SWfieldinfo	swfldinfo	retrieve information about a specific geolocation or data field
	SWcompinfo	swcompinfo	retrieve compression information about a field
	SWinqswath	swinqswath	retrieves number and names of swaths in file
	SWregionindex	swregidx	returns information about the swath region ID
	SWupdateidxmap	swupimap	update map index for a specified region
Subset	SWgeomapinfo	swgmapinfo	retrieves type of dimension mapping when first dimension is geodim
	SWdefboxregion	swdefboxreg	define region of interest by latitude/longitude
	SWregioninfo	swreginfo	returns information about defined region
	SWextractregion	swextreg	read a region of interest from a field
	SWdeftimeperiod	swdeftmeper	define a time period of interest
	SWperiodinfo	swperinfo	retuns information about a defined time period
	SWextractperiod	swextper	extract a defined time period
	SWdefvrtregion	swdefvrtreg	define a region of interest by vertical field
	SWdupregion	swdupreg	duplicate a region or time period
	SWdefscanregion		define region of interest based on range of scans

5. Data Services

File Subsetting Services

Users can limit number of files for download by specifying appropriate spatial and temporal constraints in search engines like Mirador (http://mirador.gsfc.nasa.gov/). The total download size can be further reduced by choosing a subset of variables, channels within each file through the subsetting service. AIRS file subsetting service is provided as a part of the data ordering process through Mirador search engines. The table below shows the available subsetting options for AIRS Level-1B and Level-2 products. (http://disc.sci.gsfc.nasa.gov/AIRS/data_access.shtml)

Product Name	Variable	Channel	Spatial
AIRIBRAD		√	
AIRABRAD		√	
AIRVBRAD		√	
AIRXBCAL	√	√	√
AIRX2RET / AIRH2RET	√		
AIRH2CCF/AIRI2CCF/AIRS2CCF		**√**	
AIRX2SUP / AIRH2SUP	√		

Direct data access via FTP available at

server: airspar1u.ecs.nasa.gov
directory: /data/s4pa/Aqua_AIRS_Level2/

For NRT product,

server: airscal1u.ecs.nasa.gov
diretory: /data/s4pa/Aqua_AIRS_NearRealTime

6. Data Interpretation and Screening

6.1 Quality screening and interpretation

<u>SUGGESTION TO USERS FOR CHOOSING DATA TO USE IN RESEARCH:</u>

Evaluate **Qual_CC_Rad** for FOV in Swath Data Fields:
• Researchers should use radiances only from FOVs in which Qual_CC_Rad = 0
• FOVs in which Qual_CC_Rad = 1 may be sufficiently accurate for statistical studies, but results should be carefully checked
• FOVs in which Qual_CC_Rad = 2 must be avoided

Invalid Values
For all 16-bit or longer fields the value -9999 is used to flag bad or missing data. -1 or 255 for 8-bit fields.

Each file contains all observations of a given type made during a period of exactly 6 minutes. For each day there are 240 granules, numbered 1-240. Over the course of 6 minutes the EOS Aqua platform travels approximately 1500 km, and the AIRS-suite instruments scan (whisk broom) a swath approximately 1500 km wide.
For data from launch through 12-31-2005, granule 1 spans 00:05:26Z - 00:11:26Z and granule 240 starts at 23:59:26Z and ends at 00:05:26Z the next day.
For data 12-31-2005 through the next leap second, granule 1 spans 00:05:25Z - 00:11:25Z and granule 240 starts at 23:59:25Z and ends at 00:05:25Z the next day.

Data Validation States
AIRS product validation states are “Beta”, “Provisional” and “Validated”. The state of product validation depends upon surface type, latitude and product type. **Cloud Cleared IR Radiance** is formally **Validated** product, although validation is still ongoing. Uncertainties are well defined, and products are ready for use in scientific publications, and by other agencies. There may be later improved versions of these products.

Standard Geophysical Product	**RMS Req**	**Uncertainty Estimate**	**Vertical Coverage**	**Val Status**
Cloud Cleared IR Radiance	1.0 K	Accuracy ~1 K precision 0.3-8K	N/A	Val3

Val1 = non-polar (|lat| ≤ 50°) day/night ocean.
Val2 = **Val1** + non-polar (|lat| □ 50°) night land.
Val3 = **Val2**+nonpolar day land

6.2 Pointers/References to articles discussing product validity and quality

Report on the status of V5 calibration and validation is provided in the document:
V5_CalVal_Status_Summary.pdf
(http://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/AIRS_V5_Release_User_Docs/V5_CalVal_Status_Summary.pdf)

The product-specific quality indicators and error estimates discussed in detail in the two documents:
V5_L2_Quality_Control_and_Error_Estimation.pdf
(http://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/AIRS_V5_Release_User_Docs/V5_L2_Quality_Control_and_Error_Estimation.pdf)

V5_L2_Standard_Product_QuickStart.pdf
(http://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/AIRS_V5_Release_User_Docs/V5_L2_Standard_Product_QuickStart.pdf)

7. More Information

7.1 Web resources for AIRS data users:

NASA/JPL:

- AIRS Project Web Site: http://airs.jpl.nasa.gov/
- Ask AIRS Science Questions: http://airs.jpl.nasa.gov/AskAirs/
-

NASA/GSFC:

- AIRS Data Support Main Page: http://disc.sci.gsfc.nasa.gov/AIRS/
- AIRS Data Access: http://disc.sci.gsfc.nasa.gov/AIRS/data_access.shtml
- AIRS Documentation: http://disc.sci.gsfc.nasa.gov/AIRS/documentation.shtml
- AIRS Products: http://disc.sci.gsfc.nasa.gov/AIRS/data_products.shtml

Data can also be obtained from **Giovanni** (online visualization and analysis tool): http://acdisc.sci.gsfc.nasa.gov/Giovanni/airs/

7.2 Point of Contact

URL	http://disc.gsfc.nasa.gov/	
Contact	Name	GES DISC HELP DESK SUPPORT GROUP
	Email	gsfc-help-disc@lists.nasa.gov
	Phone	301-614-5224
	Fax	301-614-5268
	Address	Goddard Earth Sciences Data and Information Services Center, Code 610.2 NASA Goddard Space Flight Center, Greenbelt, MD, 20771, USA

8. Acronyms

ADPUPA Automatic Data Processing Upper Air (radiosonde reports)
ADPUPA Automatic Data Processing Upper Air (radiosonde reports)
AIRS Atmospheric infraRed Sounder
AMSU Advanced Microwave Sounding Unit
DAAC Distributed Active Archive Center
DISC Data and Information Services Center
DN Data Number
ECMWF European Centre for Medium Range Weather Forecasts (UK)
ECS EOSDIS Core System
EDOS Earth Observing System Data and Operations System
EOS Earth Observing System
EOSDIS Earth Observing System Data and Information System
ESDT Earth Science Data Type
EU Engineering Unit
FOV Field of View
GDAAC Goddard Space Flight Center Distributed Active Archive Center
GES Goddard Earth Sciences
GSFC Goddard Space Flight Center
HDF Hierarchical Data Format
HSB Humidity Sounder for Brazil
L1A Level 1A Data
L1B Level 1B Data
L2 Level 2 Data
L3 Level 3 Data
LGID Local Granule IDentification
MW Microwave
NCEP National Centers for Environmental Prediction
NESDIS National Environmental Satellite, Data and Information Service
NIR Near Infrared
NOAA National Oceanic and Atmospheric Administration
PGE Product Generation Executive
PGS Product Generation System
PREPQC NCEP quality controlled final observation data
QA Quality Assessment
RTA Radiative Transfer Algorithm
SPS Science Processing System
URL Universal Reference Link
VIS Visible
WMO World Meteorological Organization